

What is claimed is:

- 1        1. An interference reduction method comprising the
- 2        steps of:
  - 3            a first generating step for generating a first
  - 4            scrambling code sequence;
  - 5            a second generating step for generating a second
  - 6            scrambling code sequence based on a modification of the first
  - 7            scrambling code sequence;
  - 8            a first forming step for forming a first code tree
  - 9            associated with the first scrambling code sequence;
  - 10          a second forming step for forming a second code tree
  - 11          associated with the second scrambling code sequence;
  - 12          a first spreading step for spreading a first signal
  - 13          using a first portion of the first code tree; and
  - 14          a second spreading step for spreading a second signal
  - 15          using a second portion of the second code tree, the second
  - 16          portion of the second code tree being orthogonal to the first
  - 17          portion of the first code tree.

1           2. The method according to claim 1, wherein the first  
2 forming step comprises combining a channelization code  
3 sequence and the first scrambling code sequence to form a  
4 first code tree; and the second forming step comprises  
5 combining the channelization code sequence and the second  
6 scrambling code sequence to from a second code tree.

1           3. The method according to claim 1, wherein the first  
2 signal is a control channel signal.

1           4. The method according to claim 1, wherein the second  
2 signal is a dedicated physical channel signal.

1           5. The method according to claim 1, wherein the first  
2 portion of the first code tree comprises codes formed by the  
3 first scrambling code sequence and a likewise bit pair codes  
4 of the channelization code sequence, and the second portion  
5 of the second code tree comprises codes formed by the second  
6 scrambling code sequence and an unlike-wise bit pair codes  
7 of the channelization code.

Patent Application  
Docket #34645-00517USPT

1           6. The method according to claim 1, wherein the second  
2 generating step comprises combining the first scrambling code  
3 sequence and a pseudo-random sequence to generate a second  
4 scrambling code sequence.

1           7. A method for generating a scrambling code sequence  
2 comprising:

3           receiving a first scrambling code sequence;  
4           generating a pseudo-random sequence;  
5           combining the first scrambling code sequence and the  
6 pseudo-random sequence generated to form a second scrambling  
7 code sequence.

1           8. The method according to claim 7, wherein the  
2 generating step comprises generating a pseudo-random binary  
3 sequence.

1           9. The method according to claim 8, wherein the  
2 pseudo-random binary sequence is a "+1" and "-1" sequence.

1           10. The method according to claim 7, wherein the  
2 generated pseudo-random sequence is half the rate of the  
3 first scrambling code sequence.

1           11. A scrambling code sequence generator comprising:  
2           means for receiving a first scrambling code sequence;  
3           means for generating a pseudo-random sequence;  
4           means for combining the first scrambling code sequence  
5       and the pseudo-random sequence generated.

1           12. The scrambling code sequence generator according  
2 to claim 11, wherein the means for generating is capable of  
3 generating a pseudo-random binary sequence.

1           13. The scrambling code sequence generator according to  
2 claim 11, wherein the means for generating is capable of  
3 generating the pseudo-random sequence having half the rate  
4 of the first scrambling code sequence.

1           14. A system for spreading a plurality of physical  
2       channels comprising:

3           an input for receiving the plurality of physical  
4       channels that need to be spread;

5           a first code of a first code tree for spreading at least  
6       a portion of the plurality of physical channels, wherein the  
7       first code spreads only one of the plurality of physical  
8       channels, and the first code of the first code tree  
9       comprising a combination of a channelization code and a first  
10      scrambling code; and

11          a second code of a second code tree for spreading a  
12       remainder of the plurality of physical channels, wherein the  
13       second code spreads only one of the plurality of remainder  
14       channels, and the second code of the second code tree  
15       comprising a combination of the channelization code and a  
16       second scrambling code.

1           15. The system according to claim 14, wherein the  
2       plurality of physical channels comprises a plurality of  
3       downlink physical channels.

1           16. The system according to claim 14, wherein the  
2       second scrambling code is generated by modifying the first  
3       scrambling code.

1           17. A method for forming a set of sequences for  
2       reducing interference, the method comprising the steps of:

3           generating a first subset of the set of sequences, the  
4       first subset comprising a first portion being occupied and  
5       a second portion being occupied, wherein the sequences within  
6       the first portion of the first subset are pair-wise  
7       orthogonal to one another, and the sequences within the  
8       second portion of the first subset are pair-wise orthogonal  
9       to one another and orthogonal to the sequences within the  
10      first portion of the first subset; and

11          generating at least one other subset of the set of  
12       sequences based on a modification of the sequences within the  
13       second portion of the first subset, the at least one other  
14       subset comprising a first portion being unoccupied and a  
15       second portion being occupied, wherein the sequences within  
16       the respective second portion of the at least one other  
17       subset are respectively pair-wise orthogonal to one another

Patent Application  
Docket #34645-00517USPT

18 and are orthogonal to the sequences within the first portion  
19 of the first subset, whereby, interference between the  
20 sequences of the first subset and the sequences of the at  
21 least one other subset is reduced.

1       18. The method according to claim 17, wherein said step  
2 generating at least one other subset of the set of sequences  
3 is indicative of generating a plurality of other subsets of  
4 the set of sequences comprising a first portion being  
5 unoccupied and a second portion being occupied.

1       19. The method according to claim 17, wherein the  
2 modification of the sequences within the second portion of  
3 the first subset of the set of sequences includes combining  
4 the sequences within the second portion of the first subset  
5 with a pseudo-random sequence to generate the at least one  
6 other subset.

1       20. The method according to claim 17, wherein the  
2 respective second portion of the at least one other subset  
3 is not a part of the first subset of the set of sequences.

1           21. The method according to claim 17, wherein the first  
2 portion of the first subset is used for data sequences having  
3 large gain factors.

1           22. The method according to claim 17, wherein the  
2 sequences within the second portion of the first subset and  
3 the sequences within the respective second portion of the at  
4 least one other subset are transmitted through different  
5 antennas.

1           23. The method according to claim 22, wherein the  
2 sequences within the first portion of the first subset are  
3 transmitted distributively on the different antennas, the  
4 sequences of the first portion of the first subset being  
5 control channels.

1           24. The method according to claim 17, wherein an  
2 antenna transmits the sequences within the second portion  
3 of the first subset, the sequences being orthogonal to each  
4 other.

1        25. The method according to claim 17, wherein an  
2 antenna transmits the sequences within the respective  
3 second portion of the at least one other subset, the  
4 sequences being orthogonal to each other.

1        26. The method according to claim 17, wherein the  
2 sequences within the second portion of the first subset and  
3 the sequences within the respective second portion of the  
4 at least one other subset are not orthogonal.

1        27. The method according to claim 17, wherein the  
2 first portion of the first subset is used for continuously  
3 transmitted signals, and the second portion of the first  
4 subset and the second portion of the at least one other  
5 subset are used for bursty signals.

1           28. A method for spreading a plurality of physical  
2 channels comprising the steps of:

3           receiving the plurality of physical channels that need  
4 to be spread;

5           spreading at least a portion of the plurality of  
6 physical channels using a first code of a first code tree,  
7 the first code tree comprising a primary set of sequences  
8 and a secondary set of sequences, wherein the first code  
9 spreads only one of the plurality of physical channels, and  
10 the first code of the first code tree comprising a  
11 combination of a channelization code and a first scrambling  
12 code;

13          spreading a remainder of the plurality of physical  
14 channels using a second code of a second code tree, the  
15 second code tree comprising a resultant set of sequences,  
16 wherein the second code spreads only one of the plurality  
17 of remainder channels, and the second code of the second  
18 code tree comprising a combination of the channelization  
19 code and a second scrambling code; and

20           outputting a set of sequences, the set of sequences  
21       comprising at least one of the following:  
22               the primary set of sequences of the first  
23       code tree;  
24               the secondary set of sequences of the first  
25       code tree; and  
26               the resultant set of sequences of the second  
27       code tree.

1           29. The method according to claim 28, wherein the  
2       second scrambling code is generated by modifying the first  
3       scrambling code.

1           30. The system according to claim 28, wherein the  
2       plurality of physical channels are input sequences and the  
3       set of output sequences have a common rate, whereby the  
4       common rate is smaller than the sum of the rates of the  
5       input sequences.

1           31. A method for forming a set of sequences for  
2 reducing interference, the method comprising the steps of:  
3           generating the set of sequences; and  
4           partitioning the set of sequences into subsets, the  
5 sequences within the respective subsets being respectively  
6 pair-wise orthogonal to one another, at least one of the  
7 subsets containing a primary set of sequences that are  
8 mutually orthogonal to the other sequences in the other  
9 subsets, whereby, interference between the sequences of the  
10 at least one of the subsets and the other sequences of the  
11 other subsets is reduced.

1           32. A sequence generating apparatus for forming a set  
2 of sequences, the sequence generating apparatus comprising:  
3           a generator for generating the set of sequences; and  
4           a partitioner for partitioning the set of sequences  
5 into subsets, the sequences within the respective subsets  
6 being respectively pair-wise orthogonal to one another, at  
7 least one of the subsets containing a primary set of  
8 sequences and a secondary set of sequences, wherein the

9 primary set of sequences are mutually orthogonal to the  
10 other sequences of the other subsets, whereby, interference  
11 between the sequences of the at least one of the subsets  
12 and the other sequences of the other subsets is reduced.

1       33. The sequence generating apparatus according to  
2 claim 32, wherein the other sequences of the other subsets  
3 is not a part of the sequences of the at least one of the  
4 subsets of the set of sequences.

1       34. The sequence generating apparatus according to  
2 claim 32, further comprising:  
3           a modifier for modifying the secondary set of  
4 sequences of the at least one of the subsets, the modifier  
5 combining the secondary set of sequences of the at least  
6 one of the subsets with a pseudo-random sequence forming  
7 the other subsets.

1       35. The sequence generating apparatus according to  
2 claim 32, wherein the other sequences of the other subsets  
3 contain only a secondary set of sequences.

1       36. The sequence generating apparatus according to  
2 claim 32, wherein the primary set of sequences of the at  
3 least one of the subsets is used for data sequences having  
4 large gain factors.

1       37. The sequence generating apparatus according to  
2 claim 32, wherein the secondary set of sequences of the at  
3 least one of the subsets and the other sequences of the  
4 other subsets are transmitted through different antennas.

1       38. The sequence generating apparatus according to  
2 claim 32, further comprising:  
3           an antenna for transmitting the secondary set of  
4 sequences of the at least one of the subsets, the secondary  
5 set of sequences of the at least one of the subsets being  
6 pair-wise orthogonal to one another.

1       39. The sequence generating apparatus according to  
2 claim 32, further comprising:

Patent Application  
Docket #34645-00517USPT

3           at least one other antenna for transmitting a single  
4       one of the other sequences of the other subsets, the single  
5       one of the other sequences of the other subsets being pair-  
6       wise orthogonal to one another.

1           40. The sequence generating apparatus according to  
2       claim 32, wherein the primary set of sequences of the at  
3       least one of the subsets is used for continuously  
4       transmitted signals, and the secondary set of sequences of  
5       the at least one of the subsets and the other sequences of  
6       the other subsets are used for bursty signals.

00517USPT

1           41. A system utilizing a set of sequences for  
2 reducing interference therein, the system comprising:

3           means for sending signals formed from sequences of a  
4 first subset of the set of sequences, the first subset  
5 comprising a first portion being occupied and a second  
6 portion being occupied, wherein the sequences within the  
7 first portion of the first subset are pair-wise orthogonal  
8 to one another, and the sequences within the second portion  
9 of the first subset are pair-wise orthogonal to one another  
10 and orthogonal to the first portion of the first subset;  
11 and

12           means for sending signals formed from sequences of at  
13 least one other subset of the set of sequences based on a  
14 modification of the sequences within the second portion of  
15 the first subset, the at least one other subset comprising  
16 a first portion being unoccupied and a second portion being  
17 occupied, wherein the sequences within the respective  
18 second portion of the at least one other subset are pair-  
19 wise orthogonal to one another, and orthogonal to the  
20 sequences within the first portion of the first subset,  
21 whereby, interference between the signals using the

22 sequences of the first subset and the signals using the  
23 sequences of the at least one other subset is reduced.

1           42. The method according to claim 41, wherein the  
2 modification of the sequences within the second portion of  
3 the first subset of the set of sequences includes combining  
4 the sequences within the second portion of the first subset  
5 with a pseudo-random sequence to generate the at least one  
6 other subset.

1           43. The system according to claim 41, wherein the  
2 system is selected from the group consisting of: a  
3 communication system and a wireless communication system.

1           44. The system according to claim 41, wherein the  
2 signals formed from the first portion of the first subset  
3 comprises control signals.

1           45. The system according to claim 41, wherein the  
2 signals formed from the second portion of the first subset  
3 and the second portion of the at least one other subset  
4 comprises physical dedicated channel.